II. Applicant's Response to the Examiner's Rejections

The Applicants traverse the rejection of the above-noted claims for the reasons set forth below.

A. Rejection of claims under 35 U.S.C. §103

(i) Claims 1-3

The present invention is directed to a circuit and corresponding method for generating an optimal initial rasterization starting point estimate for a rasterizer (e.g. raster engine) to use when rendering an image. The initial rasterization starting point can be used to efficiently render a primitive by providing an appropriate raster engine with an initial scanning point that is substantially within the primitive to be rendered. By employing the circuit and method of the present invention, the time for scanning and rendering a primitive is significantly reduced as compared to conventional methods. The inventive method of the present invention is defined in claim 1 which calls for, among other things:

> "...generating region bits representing the location of the sorted vertex data with respect to a current tile being rendered;
> generating coordinate data representing an initial rasterization starting point estimate when the region bits indicate that at least one of the sorted vertex data lies within the current tile being rendered and discarding the vertex data of primitives that lie outside the boundary of the current tile being rendered..."

In performing the aforementioned operations, the initial rasterization starting point of a primitive provided by the present invention is substantially within the current tile being rendered. Thus, any downstream rendering logic can be simplified as the sorted vertex data is provided in a predetermined manner. Additionally, rendering time is reduced as the initial rasterization starting point is substantially within the tile currently being rendered. Therefore, valuable processing time is not wasted finding a point within the primitive to be rendered. Such combination of operations and the benefits provided thereby are not taught or suggested by the combination of references as cited by the Examiner. Consequently, the combination of Aleksic, Lentz, et al., Sfarti and Wong, et al. does not render the invention as defined in claim 1 obvious.

As understood Aleksic is directed to a pixel scanning method used when a portion of a primitive being scanned crosses, or lies outside of, a page boundary. The scanning of the primitive is described, for example, at col. 3, line 62-col. 4, line 10 (i.e. walk-a-long each span,

incrementing an x-coordinate of pixels along the span and decrementing the number of pixels making up the span). However, Aleksic appears to be silent on sorting vertex data or how to generate an initial rasterization scan point based, in part, on the sorted vertex data. Thus, Aleksic does not render the invention as defined in claim 1 obvious.

Adding the teachings of Lentz, et al. to the teachings of Aleksic will also not render the invention as defined in claim 1 obvious as Lentz, et al. does not overcome the aforementioned deficiencies of Aleksic. In addition, Lentz, et al. also does not teach or suggest the aforementioned combination of operations performed to generate the initial rasterization starting point as defined in claim 1. As understood, Lentz, et al. is directed to a system and corresponding method for rendering polygons that incorporate a w-bit wide render mask to provide an indication of which bits along a scan line are to be subsequently rendered. *See*, for example, col. 6, lines 34-55. However, there is no teaching or suggestion of the generation or use of data representing an "...initial rasterization starting point..." as defined in claim 1. In fact, Lentz, et al. expressly discloses, and therefore teaches, that "methods for determining the order of traversal are not discussed here." (*see*, col. 9, lines 52-53). Thus, determining an initial rasterization starting point is <u>not</u> a consideration or requirement of Lentz, et al. To further augment this point, the Examiner's attention is directed to col. 10, lines 31-33 of Lentz, et al., which states in pertinent part:

> "...[t]he traversal algorithm begins the scan at some pixel and determines the value of the edge variables based upon the functions above..."

However, Lentz, et al. is silent on how to determine the beginning scan point. Consequently, as Aleksic appears to be silent on generating "...an initial rasterization starting point..." based, at least in part, on region bits resulting from previously sorted vertex data and Lentz, et al. explicitly does not teach, and is not directed to, the generation of an initial rasterization starting point (*see*, col. 10, lines 31-33), the combination of Aleksic and Lentz, et al. does not render the invention as defined in claim 1 obvious.

To overcome the aforementioned shortcomings of Aleksic and Lentz, et al., the Examiner adds the teachings of Sfarti to the combined teachings of Aleksic and Lentz, et al. and states that the combination thereof renders the claimed invention obvious. The Applicants traverse the addition of Sfarti to the combined teachings of Aleksic and Lentz, et al. as there is no motivation within either Aleksic or Lentz, et al. to combine the teachings provided therein to the teachings

of Sfarti. As discussed in greater detail above, Aleksic does not appear to teach or suggest sorting incoming vertex data as such reference appears to be silent on generating "...an initial rasterization starting point..." based, at least in part, on region bits resulting from previously sorted vertex data. Moreover, Lentz, et al. does not teach or suggest sorting incoming vertex data, particularly for use in generating a "...initial rasterization starting point..." as determining an initial rasterization starting point based on sorted vertex data is not a consideration or requirement of Lentz, et al. (*see*, for example, col. 9, lines 52-53 and col. 10, lines 31-33). Thus, combining the teachings of Sfarti to the combined teachings of Aleksic and Lentz, et al. is improper under MPEP 2143.01, and should be withdrawn.

Substantively, combining the teachings of Sfarti to the combined teachings of Aleksic and Lentz, et al. does not render the invention as defined in claim 1 obvious as Sfarti does not overcome the aforementioned deficiencies with respect to the combination of Aleksic and Lentz, et al. As understood, Sfarti is directed to an image processor which employs a rasterization method where vertices that define a primitive to be rendered are sorted for later processing. However, the initial point to begin scanning the primitive lies outside of the primitive to be rendered (*see*, for example, col. 7, lines 24-27 and FIG. 6 and col. 10, lines 17-18). Thus, as the initial point with which to begin scanning lies outside of the primitive to be rendered, Sfarti does not teach or suggest "...generating coordinate data representing an initial rasterization starting point estimate when the region bits indicate that at least one of the sorted vertex data lies within the current tile being rendered..." as defined in claim 1. Accordingly, Sfarti does not render the invention as defined in claim 1 obvious. As there does not appear to be any motivation within Aleksic or Lentz, et al. to sort incoming vertex data before processing of the primitive defined thereby, and Sfarti does not render the invention as defined in claim 1 obvious, the improper combination of Aleksic, Lentz, et al. and Sfarti does not render the invention as defined in claim 1 obvious.

Adding the teachings of Wong, et al. to the improperly combined teachings of Aleksic, Lentz, et al. and Sfarti will also not render the invention as defined in claim 1 obvious as Wong, et al. does not overcome the aforementioned deficiencies related to the combination of Aleksic, Lentz, et al. and Sfarti. In addition, Wong, et al. does not teach or suggest the combination of limitations as defined in claim 1. As understood, Wong, et al. is directed to a scanning methodology where the scan direction is selected based on a determination of major and minor

axes (*see*, for example, col. 4, lines 20-23) of a polygon to be rendered. The scan axes are selected in response to an edge function (*see*, for example, col. 6, lines 13-67). Based on the results of the edge function, the resulting polygon is classified into one of several groupings (*see*, for example, FIGS. 9-10 and col. 5, lines 31-44). The resulting group value is used to index a lookup table, which provides the initial sampling point (*see*, for example, col. 5, lines 45-50). Thus, the location at which a raster engine initially scans a polygon, as disclosed in Wong, et al., is not based on generated "...region bits..." as defined in claim 1, but rather on a value contained in a lookup table. Thus, Wong, et al. does not render the invention as defined in claim 1 obvious.

Consequently, as the Examiner has submitted an improper combination of Aleksic, Lentz, et al. and Sfarti; and the combination of Aleksic, Lentz, et al., Sfarti and Wong, et al. fails to teach or suggest the invention as defined in claim 1, their combination does not render the invention as defined in claim 1 obvious. Accordingly, reconsideration of the rejection of claim 1 is respectfully requested.

Claim 2 depends upon and includes all of the limitations of claim 1 and is allowable at least for the reasons set forth above with respect to claim 1. In addition, the Applicants are unclear as to the basis of the rejection of claim 2; therefore, the Applicants cannot appropriately comment or respond to the alleged rejection of claim 2. More specifically, on page 5, paragraph 1 of the Office Action, the Examiner indicates that "...regarding claim 2, Aleksic discloses that generating an orientation bit representing an orientation of a line connecting the first and second vertices of the sorted primitive with respect to a line connecting the first and third vertices of the sorted primitive before generating the initial rasterization starting point coordinates...". Then, in paragraph 2 of the same page the Examiner states that "...Aleksic does not explicitly disclose that representation of orientation bit..." As the Examiner has indicated that the same reference (i.e. Aleksic) both discloses and does not disclose the invention as defined in claim 2, the Applicants are not clear whether claim 2 has been rejected. To remove any confusion, the Applicants respectfully request that the Examiner further clarify the rejection of claim 2, if any, in a subsequent non-final Office Action.

Claim 3 was cancelled in the previously submitted Preliminary Amendment mailed March 27, 2002. Thus, the rejection of this claim is moot.

(ii) Claims 14-26

The above discussion of the inappropriateness of combining Aleksic, Lentz, et al. and Sfarti is equally applicable to the rejection of the aforementioned claims and is incorporated in its entirety herein. In addition, the Applicants further traverse the rejection of claims 14-26 for the reasons set forth below.

Claim 14 is an apparatus claim that defines a circuit for providing the initial rasterization starting point estimate according to the present invention. As defined in claim 14, the inventive circuit of the present invention includes the following combination of components:

> "...a region calculation circuit, coupled to the sorting circuit, operative to receive the sorted vertex data and to generate region bits representing the location of the sorted vertex data with respect to a current tile being rendered; and
>
> an initial rasterization starting point circuit, coupled to the region calculation circuit, operative to generate an initial rasterization starting point coordinate in response to the region bits, the initial rasterization starting point circuit including a discard circuit operative to discard the vertex data of a primitive that lies outside the boundary defined by the current tile..."

Such combination of components is not taught or suggested by the combination of references as cited by the Examiner. Consequently, the combination of Aleksic, Lentz, et al., Sfarti and Wong, et al. does not render the invention as defined in claim 14 obvious.

As discussed in greater detail in Section II(A)(i), Aleksic appears to be silent on how the initial scan point is generated. Lentz, et al. does not discuss, or is concerned with, how the initial scan point is determined. Thus, the combination of Aleksic and Lentz, et al. does not teach or suggest "...an initial rasterization starting point circuit, coupled to the region calculation circuit, operative to generate an initial rasterization starting point coordinate in response to the region bits..." as defined in claim 14. In addition, Sfarti does not teach or suggest "...an initial rasterization starting point circuit, coupled to the region calculation circuit operative to generate an initial rasterization starting point coordinate in response to the region bits..." as the initial point with which the process of Sfarti begins scanning lies outside of the primitive to be rendered. (*See*, for example, FIG. 6 and col. 10, lines 17-18). Moreover, Wong, et al. discloses that the initial rasterization starting point is based on information contained in a lookup table as indexed by a value generated by an edge function (*see*, for example, col. 6, lines 63-67), which does not depend upon, use or relate to region bits. Thus, as none of the references cited by the Examiner teaches or suggests generating an initial rasterization starting point circuit

"...operative to generate an initial rasterization starting point coordinate in response to the region bits..." where the region bits are defined at least in part by sorted vertex data, the Applicants submit that the combination of references does not teach or suggest at least this limitation of claim 14.

In addition, none of the aforementioned references teaches or suggests the use or operation of "...a discard circuit operative to discard the vertex data of a primitive that lies outside the boundary defined by the current tile..." as defined in claim 14. More specifically, Aleksic, Lentz, et al. and Sfarti are silent on the use of a discard circuit. Wong, et al. does not disclose the use or operation of a discard circuit as the scanning of a primitive, or other suitable polygon, is started at the corner of a tile to be rendered (*see*, for example, col. 5, lines 49-50) and continues along both the major and a minor axes until the polygon to be rendered is located (*see*, for example, col. 7, lines 12-43). As such, because scanning is defined as being performed within an entire tile, discarding is not performed. Consequently, as neither Aleksic, Lentz, et al., Sfarti or Wong, et al. teaches or suggests the use or presence of "...a discard circuit operative to discard the vertex data of a primitive that lies outside the boundary defined by the current tile..." as defined in claim 14, the combination of such references also does not render the aforementioned limitation obvious.

Consequently, as the combination of Aleksic, Lentz, et al., Sfarti and Wong, et al. does not teach or suggest at least two limitations of claim 14, such combination of references does not render the invention as defined in claim 14 obvious. Moreover, the combination of the aforementioned components that comprise the circuit of the present invention is also not taught or suggested by the combination of references; nor is there any motivation provided in Aleksic or Lentz, et al. to make such a combination. Accordingly, reconsideration of the rejection of claim 14 is respectfully requested.

Claims 15-26 directly or indirectly depend upon and include all the limitations of claim 14 and are allowable at least for the reasons set forth above with respect to claim 14. In addition, these claims define subject matter that is allowable over the art of record. For example, claim 15 provides a more detailed definition of the structure and functionality of the initial rasterization starting point circuit by defining the "...trivial accept circuit..." and the corresponding functionality thereof. It is respectfully submitted that the structure and functionality, for example, of the trivial accept circuit as defined in claim 15 is not taught or suggested by the

combination of references as cited by the Examiner. Accordingly, reconsideration of the rejection of claims 14-26 is respectfully requested.

(iii) Claims 27

Claim 27 is an apparatus claim which defines a circuit for optimally determining an initial rasterization starting point including the following components:

> "...a region calculation circuit, coupled to the sorting circuit, operative to receive the sorted vertex data and to generate region bits representing the location of the sorted vertex data with respect to a current tile being rendered; and
> an initial rasterization starting point circuit, coupled to the region calculation circuit, operative to generate an initial rasterization starting point coordinate when the region bits indicate at least one of the sorted vertex data lies within the current tile, the initial rasterization starting point circuit including a discard circuit operative to discard the vertex data of primitives whose vertices lie outside the boundary defined by the current tile..."

As such, claim 27, like claim 14 above, includes limitations directed to the combination of "...a region calculation circuit...to generate region bits representing a location of the sorted vertex data..." and "...initial rasterization starting point circuit...operative to generate an initial rasterization starting point coordinate..." based, in part, on the region bits. Thus, claim 27 is allowable at least for the reasons set forth above with respect to claim 14. Accordingly, reconsideration of the rejection of claim 27 is respectfully requested.

B. Provisional Double Patenting Rejection

To overcome the provisional obviousness type double patenting rejection of claims 1-3 and 14-27 based on co-pending Application No. 09/244,265, the Applicants submit herewith a terminal disclaimer disclaiming the terminal part of any patent granted on the above-identified application, which would extend beyond the expiration date of any patent granted on Application No. 09/244,265. The terminal disclaimer is provided at the end of this amendment as Exhibit A.

The Commissioner is hereby authorized to charge any underpayment or credit any overpayment to Deposit Account No. 50-0441 for any payment in connection with this communication, including any fees for extension of time, which may be required. The Examiner is invited to call the undersigned if such action might expedite the prosecution of this application.

Respectfully submitted,

By: 

Loren H. McRoss
Registration No. 40,427

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VEDDER, PRICE, KAUFMAN & KAMMHOLZ
222 N. LaSalle St.
Chicago, IL 60601
(312)609-7500
FAX: (312)609-5005